Defense Industries in Asia and the Technonationalist Impulse

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Abstract: Asia is a region of growing militarization and insecurity. It is increasingly characterized by rising defense expenditures and rapidly modernizing militaries, and subsequently it is increasingly becoming a zone of potential conflict. These security concerns are exacerbated by Asian countries' expanding capacities for indigenous armaments production. Asian arms production is heavily influenced by concepts of techno-nationalism, which views autarky (self-sufficiency in armaments) as serving not only national defense needs, but also as maximizing national political, strategic, and economic autonomy. The technonationalist model is more than a set of goals; it also embodies a strategy for achieving autarky in armaments production, including the short-term exploitation of foreign-sourced technologies. What is the most interesting about Asian arms industries is how enduring they have been despite the fact that they produce few economic benefits and contribute so little to guaranteeing security of supply or expanding military-technological capacities for national defense. Asian armaments production has rarely been cost-effective or militarily significant in terms of turning out state-of-the-art military equipment. And yet, most large powers in Asia have not abandoned the idea of autarky in armaments production, often with explicit technonationalist industrial strategies. Despite problems with this technological-industrial approach, it is unlikely that these countries will abandon techno-nationalism anytime soon.

Introduction

Asia is an area of growing militarization and, subsequently, of growing regional insecurity. For the past two decades or so, nearly major country in region has experienced real, and often quite significant, increases in defense spending. As a result, many countries in Asia have able to bankroll major military modernization activities, and these efforts have yielded a considerable expansion in the capabilities and capacities of regional militaries. Many of these capabilities—such as submarines or antiship missiles, long-range air interdiction, or maritime strike—were previously lacking in many of these forces, and as these means for modern warfighting continue to proliferate throughout the region, it raises the concern that any conflict in the region, should it occur, is likely to be more intense, more lethal, and therefore perhaps more devastating in its effects.

Compounding these concerns is the fact that Asian countries are increasingly capable of supplying themselves with these new means of warfare, which has been slowly but surely displacing the traditional practice of acquiring these from abroad. Interestingly, Asia is still often overlooked as a centre of armaments production. Most of the largest arms-producing states are still located in North American and Western Europe, and as a whole, Asia accounts for less than ten per cent of all

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global weapons manufacturing. Nevertheless, that still makes it the world's third largest defense-industrial hub—and it is growing, in terms of the numbers, variety, and the sophistication of its weapons systems.[1] Moreover, as defense spending continues to languish in Europe, the focal point of global armaments production is slowly shifting from the North Atlantic to the Asia-Pacific. Some of the world's biggest military spenders are located in Asia, including China, India, Japan, Pakistan, and South Korea. China, in fact, already has the world's second highest defense budget; its estimated military research and development (R&D) spending (perhaps as high as USD 10 billion a year) is twice as great as all of Europe combined.[2] And while it is true that Asian militaries still import large chunks of their arms from the West, this trend will not last. Most of the biggest military spenders in Asia also possess sizable defense industries, and their governments are committed to increasing their purchases from local arms suppliers.

Nation-states—not just in Asia but around the world—have many reasons to produce armaments, but traditionally the strongest motivation has been classically realist and security-oriented: the need to provide for a secure source of military materiel necessary to deter threats and to defend one's national territory. Possessing or attempting to possess strong domestic arms industries, capable of designing, developing, and manufacturing advanced weapons systems, is viewed by many countries as an essential element of this strategy. Consequently, *autarky*, or self-sufficiency in arms acquisition, can be a critical national-security objective. At the same time, however, such autarky traditionally had quite limited military motivations, that is, national defense. Increasingly, however, many nations—and particularly those in Asia—have come to view indigenous arms production from a much broader perspective: the idea that autarky in armaments serves larger, more ambitious national interests: it is about securing and advancing a nation's geopolitical status in a regional or global system. This particularly *technonationalist* approach to armaments production has become endemic to Asia, and it is critical to understand why and how this trait has so strongly influenced regional defense industrialization and arms manufacturing. It is also important to always keep the 'technonationalist impulse' in mind when addressing how Asian nations deal with problems and failures when it comes to indigenous armaments production, and why, despite whatever setbacks they may encounter, maintaining and expanding their national defense-industrial bases remains a high priority.

At the same time, techno-nationalism in armaments production is not easy, and for most countries it has been a hard row to hoe. The challenge to Asian arms industries is meeting the growing demand for self-sufficiency in arms acquisition, that is, autarky in production, as well as the rapidly increasing technological requirements of next-generation weapons systems. In other words, can Asian defense factories develop and produce the types of advanced weaponry that their militaries increasingly clamour for, and do so under domestic political and economic conditions that demand increasing self-reliance in production, from initial design all the way to final manufacturing.

This article addresses defense industrialization among the leading arms-producing states in Asia and how the 'technonationalist impulse' has not only driven

defense industrialization in the region, but also how techno-nationalism has also provided a model for development (i.e. with the ultimate objective of autarky). It explores the paradoxically symbiotic relationship between techno-nationalism and 'techno-globalism', and the critical role that foreign technologies have played in process of defense-industrial indigenization. Finally, it discusses whether the techno-nationalist model is a viable or sustainable approach, in terms of economics and (especially) military innovation. In concluding, this article argues that, despite the disincentives surrounding indigenous armaments production—in terms of the high cost of autarky and the dubious military gains that tend to accrue—most Asian states will not abandon their defense industries or the goal of achieving autarky, and that is due mainly (and increasingly) to the driving force of military techno-nationalism.

Why Do Countries Produce Arms?

Nearly country in Asia manufactures some kind of arms. In most cases, however, the types, quantity, and quality of weaponry produced are relatively inconsequential. A good deal of local armaments production is relatively 'low-tech': small arms (rifles and pistols), ammunition, armoured cars, aluminium-hulled patrol boats, and the like. Moreover, much of this manufacturing is based on the assembly of foreign weapons systems, such as the licensed production of US M16 assault rifles or putting together imported kits for helicopters or armoured vehicles. Consequently, most Asian arms manufacturers could at best be described as 'third-tier' producer-states, occupying the lowest strata in the global hierarchy of arms-producing states.

That said, there exist a few countries in Asia—so-called 'second-tier' producer-states—that are heavily (or increasingly) engaged in arms manufacturing, and which have built up quite extensive, and in some areas quite sophisticated, indigenous arms industries, capable of designing, developing, and manufacturing their own weapons systems. These are generally of three types: (1) technologically advanced industrialized countries that produce a limited array of state-of-the-art weapons systems (e.g. Japan); (2) newly industrialized economies containing modest (but growing, in both in terms of range of production and military capabilities) military-industrial complexes (e.g. Indonesia, Singapore, South Korea, and Taiwan); and (3) rising great powers with large, broad-based defense industries but still lacking in certain areas of indigenous R&D and industrial capacities when it comes to developing and producing highly sophisticated conventional arms (e.g. China and India).[3] It is with this rather catholic grouping of second-tier Asian producer-states that we are most concerned with in this article.

Despite their varied backgrounds and varying defense-industrial capacities, these countries share many motives for developing and producing their own arms. One of the strongest of these is the security-driven imperative for self-reliance in defense.[4] In a basically anarchic international security system, nation-states are naturally impelled to seek an independent defense capability. In order to defend its territory satisfactorily, therefore, a nation-state requires a reliable source of armaments, and the most dependable source is generally a domestic one. Additionally, relying too

heavily on arms imports means exposing the nation-state to embargoes or to technology holdbacks, thus risking its ability to acquire the weapons it deems essential to its national defense. Such foreign dependencies can also leave a country vulnerable to coercive efforts by a supplier-state who might try to use the threat of withholding arms deliveries in order to extract certain kinds of behaviour on the part of the recipient, such as respect for human rights or to stop international aggression by the buyer-state. In a global environment where supplier restraint—whether real or potential—is a critical national-security concern, security of supply can be a key factor driving local defense industrialization.

In addition to fulfilling perceived requirements for self-sufficiency, arms production has often been seen as an important mechanism for driving a country's overall economic development and industrialization. Defense industrialization had potential backward linkages spurring the expansion and modernization of other sectors of the national economy, such as steel, machine tools, and shipbuilding.[5] Industrialization and technological advancement was seen as feeding into the development of domestic arms-manufacturing capabilities, such as building up general skills and know-how, and in providing lead-in support or equipment for arms production. The construction of warships, for example, stimulated the establishment of indigenous shipbuilding industries, for example, while production of military vehicles required steel mills and automotive factories to provide critical parts and components, such as armour plating, chassis, and engines, and skilled labour to assemble these vehicles.

The Republic of Korea (ROK), for example, consciously pursued parallel strategies of 'security and development', that is, building up its heavy industry and high-technology sectors at the same time as it strove for self-sufficiency in arms production.[6] Particularly during the Park Chung-hee regime (1961–1979), South Korea's leadership viewed economic development to be an essential element of national security, and, as such, state investments in heavy industry sectors like steel, machinery, transportation, and chemicals were regarded as directly contributing to defense preparedness.[7] Industrialization and technological advancement were seen as feeding into the development of domestic arms-manufacturing capabilities, such as building up general skills and know-how, and in providing lead-in support or equipment for arms production. The establishment of the South Korean commercial shipbuilding industry, for example, facilitated the construction of warships, while the creation of a domestic steel industry and, later, a domestic automobile industry, provided the parts and materiel (such as armour plating, chassis, and engines), as well as the skilled labour necessary for the production of military vehicles.

At the same time, armaments production was viewed as a 'technology locomotive' spurring the growth of new industries and new technologies, particularly in the area of aerospace, electronics, and information technologies sectors.[8] Military aerospace programs, for example, often constituted the basis for civil aircraft and aviation production in nearly all of the second-tier arms-producing states. Initially based on military-led industrialization, for example, Brazil's Embraer subsequently expanded into the regional jet business; Israel's various high-technology sectors have also benefited greatly from cross-fertilization with military industries.[9] With regard to Asia, South Korea has attempted to exploit military-to-commercial spin-

offs in its communications, electronics, machine tool, and transportation sectors.[10] More recently, Harold argued that the administration of President Lee Myung-bak (2008–2013) sought to make 'South Korea's defense industry into an "engine of growth" that would average USD 4 billion worth of exports per year and employ 50,000 people by 2020.'[11]

Techno-nationalism and Asian Armaments Production

More than any other factor, however, the technonationalist impulse appears to have driven defense industrialization in Asia. Techno-nationalism (a word first coined by Robert Reich in the 1980s[12]) is more than just a 'security of supply' issue or a fancier word to describe protectionist economic and developmental policies. The technonationalist impulse is, of course, not limited to just armaments production or just to Asia. Many other industrial sectors in Asia have benefitted from technonationalist policies, such as iron and steel, automobiles, electronics, shipbuilding, and the like. Japan and Korea, for example, have invested billions in building up domestic aircraft industries. Besides Asia, many nations around the world have pursued technonationalist policies and approaches when it comes to arms manufacturing. Beginning in the 1960s, Brazil embarked on an ambitious defense industrialization program, according to a national policy of *segurança e desenvolvimento* (security and development), which entailed large public investments in armaments, as well as in other heavy industry and high-technology sectors.[13]

Nevertheless, there appears to be no good definition as to what constitutes 'military techno-nationalism'. At its most fundamental level, techno-nationalism simply entails the indigenous development of technology—as much for its own sake as for any economic benefits it might incur. As David Edgerton put it, techno-nationalism was about countries, through indigenous technological development, trying to determine their place in the global pecking order, even if this was just 'bragging rights'.[14] At the heart of techno-nationalism is, of course, the nation-state:

> Techno-nationalism assumes that the key unit of analysis for the study of technology is the nation: nations are the units that innovate, that have R&D budgets and cultures of innovation, that diffuse and use technology. The success of nations, it is believed by techno-nationalists (who rarely if ever label themselves as such), is dependent on how well they do this.[15]

As techno-nationalism has been used by such defense analysts and political economists as Richard Samuels and Christopher Hughes, however, it has come to mean much more, at least in a military context.[16] In the particular case of armaments production, techno-nationalism is as much about securing geopolitical and strategic autonomy as it is about achieving technological and industrial self-sufficiency when it comes to defense. In other words, military techno-nationalism serves broad, bold national strategic ambitions, particularly the emergence of a country as a modern, independent, even powerful, nation-state. Samuels argues that techno-nationalism is nothing less than the 'struggle for independence and autonomy through the indigenization of technology'.[17] It is, he adds, the 'embrace of technology for national security'.[18] Hughes

describes techno-nationalism as 'maximizing military-technological autonomy in order to maximize national strategic autonomy'.[19] Tyroler-Cooper and Peet, for their part, define the technonationalist model as 'characterized by a focus on the development of indigenous capabilities for self-reliance and autonomy'.[20] In short, techno-nationalism views autarky in military technology to be just as crucial to national security as is any particular weapon system.

Techno-nationalism in armaments production is particularly apropos for states aspiring to great-power status. As Samuels notes, a nation-state cannot expect to be taken seriously unless it possesses a modern military, that is, 'rich nation/strong army'. At the same time, an aspiring great power's armed forces may not be credible if it relies on other nations for the bulk of its weaponry. To extend Samuel's 'rich nation/strong army' analogy further, therefore, great nations have great arms industries. This line of reasoning has been particularly ubiquitous when it comes to Asian armaments production: most large countries in the region—China, India, Japan, South Korea, Indonesia—have all attempted to create indigenous defense industries and to engage in ambitious arms-manufacturing programs in order to buttress their regional great-power ambitions.[21]

Military techno-nationalism may have its roots in national security and economics, but it goes beyond that. It is about status—in this case, a particular nation's place in the international hierarchy of great powers. This is the appeal and power of military techno-nationalism, at least as it applies to indigenous armaments production: when the national security and economic arguments buttressing domestic weapons manufacturing fail, many nations still persist in pursuing autarky (and sometimes even 'double down' in their commitments).

But techno-nationalism is more than an objective or a set of goals—it is also a plan of action. The technonationalist model contains its own strategy for achieving autarky in armaments production, one that, paradoxically, involves the exploitation of *imported* technologies in order to eventually realize self-sufficiency. This process usually entails the course of moving from *learning* to *innovating,* of going from *imitating* technology to *owning* and *advancing* technology—in this particular case, for the creation and promotion of a national indigenous defense industry. As the *Economist* puts it, 'The focus is laid on national goals through accessing foreign technology and the monopolization of technology.'[22]

Samuels divides the technonationalist process into three stages: indigenization, diffusion, and nurturing.[23] 'Indigenization' refers to the acquisition of technology and its insertion into the local technological and industrial base; since this technology typically originates from foreign sources (e.g. through technology transfers or licensed production), there is arguably a 'technoglobalist' aspect to techno-nationalism at this phase (what some have described as a 'techno-hybrid' model; this will be discussed in greater detail below).[24] In any case, the technonationalist process is most critical for its 'diffusion' and 'nurturing' phases, in which the technology, however acquired, is assimilated and circulated throughout the national technology base, and is further 'processed' with localized inputs, that is, indigenous R&D. The end result is that the technology has been changed and advanced sufficiently that it is something new and innovative.

Japan is perhaps the most closely associated with the technonationalist model when it comes to defense industrialization.[25] Richard Samuels' seminal work, *Rich Nation, Strong Army*, describes how central techno-nationalism was to the Japanese idea of *kokusanka*, or self-reliance, in arms manufacturing. Wealth and power went hand-in-hand, and economic and technological development was crucial to the creation of a militarily strong state. For Japan, therefore, techno-nationalism was the 'embrace of technology for national security'.[26] Industrial power and military strength were fused, and technology was the key. Christopher Hughes echoes Samuels, and argues that techno-nationalism and *kokusanka* goes back at least as far as the Meiji Restoration and establishment of modern Japan. The 'ultimate objective' of technonationalist armaments production, he says, was always autarky.[27]

Even after its defeat in World War II, Japan aggressively pursued a policy of *kokusanka* when it came to arms manufacturing. Tokyo has put considerable resources into building up and maintaining a technologically advanced domestic arms industry, and the 'indigenization' of defense production has long been national policy. On the surface, this practice has been highly successful: Japan is capable of building its own locally designed tanks, armoured vehicles, warships, submarines, and various missile systems. It has also developed and manufactured two indigenous fighter jets—the F-1 and F-2 (the latter a highly modified version of the US F-16 fighter) and numerous trainer aircraft. Consequently, the Japan Self-Defense Force is almost entirely self-sufficient in military equipment. Where it was forced to import, often because the cost of totally indigenous development was too high, Tokyo secured licenses to manufacture these weapons in Japan; even then, the long-term goal was always to eventually replace licensed production with domestically developed systems.

Additionally, a reduced reliance on foreign sources of arms was viewed as a means for strengthening national political independence *vis-à-vis* its mutual defense treaty with the USA. Proponents of *kokusanka*, for instance, argued that this industrial strategy would provide Tokyo with greater freedom of action in international affairs. At the same time, *kokusanka* was seen as helping to strengthen Tokyo's security relationship with the USA and permitting Japan to play a larger role in the bilateral alliance.[28]

Japanese techno-nationalism was different from other Asian countries' approaches in that it stressed a high degree of civil–military integration. Both Samuels and Hughes note that arms production in Japan traditionally entailed a dual-use approach to technology: technology was consciously intended to 'interdiffuse' between the military and civilian sectors.[29] According to Samuels, the Japanese process of defense innovation involved the deliberate spread of advanced technologies beyond their original function and intent, via 'joint ventures, technology exchange agreements, cross-licensing, second-sourcing, production-sharing', and so on.[30] As Hughes put it, 'a key and constant feature of this drive for autonomous defense production has been to promote indigenous production … in tandem with integration where possible of civilian and military defense production'.[31] Consequently, technological breakthroughs and progress in armaments production were *supposed* to spin-off to commercial projects (such as military aircraft manufacturing

helping to support firms in their efforts to expand into commercial aerospace, or through providing offshoot technologies that found their way into Japanese 'bullet-train' programs); at the same time, commercial R&D was supposed to be spun on to military work (Samuels notes that advances in Japan's civilian microchip industry had direct military applications when it came to airborne active phased-array radar).[32]

China, too, has long pursued a technonationalist strategy when it comes to indigenous arms production. Gill and Kim observed that the Chinese quest for autarky in armaments goes back to the 19th century, noting that modernizers during that time knew that China could 'not simply import complete weapons systems but also [had to] learn from foreign production techniques in order to establish a self-sufficiency in arms production'.[33] This became the basis for the so-called *tiyong* concept of the Qing dynasty: *zhongxue weiti, xixue weiyong* ('Chinese learning for substance, Western learning for use'); inherent in this concept is the idea that China should exploit foreign technology as much as it can in order to wean itself eventually off of it.[34]

The idea of being autonomous in the development and manufacture of arms has been no less critical under the present-day People's Republic of China (PRC).[35] Self-reliance (*zili gengsheng*) remains even more so an 'indispensible component ... of national security',[36] and, as such, the PRC's defense industry has always been 'geared toward the objective of autonomy'.[37] Even though the PRC in its early years (1949–1961) had to rely heavily upon the Soviet Union for military technology (both weapons systems and production capacities), it was always China's long-term goal to 'return to the first path' of self-reliance.[38] If anything, China's unhappy experiences with foreign military-technical assistance—that is, the abrupt cutoff of Soviet military aid in the early 1960s and the Western arms embargo following the 1989 Tiananmen Square crackdown—only reinforced its natural impulses to become eventually self-reliant in arms production.[39] By the early 1970s, therefore, the Chinese were actively engaged in the development of a number of indigenously designed weapon systems, including fighter aircraft, ballistic and antiship cruise missiles, tanks, surface combatants, and submarines (and, of course, nuclear weapons).

The current phrase to express this desire for autarky in defense production and acquisition is, according to Tai Ming Cheung, *zizhu chuangxin*, or 'innovation with Chinese characteristics' (also sometimes translated as 'indigenous innovation', 'autonomous innovation', and 'self-reliant innovation').[40] According to Cheung, *zizhu chuangxin* is a 'core aspiration' of China's political, military, and defense-industrial leadership, and, in particular, it has been formalized in the 2006–2020 Medium- and Long-Term Defense Science and Technology Development Plan.[41] It basically entails four broad approaches towards technological innovation and development: (1) introduce, (2) digest, (3) assimilate, and (4) re-innovate (what Cheung dubs the IDAR strategy). Interestingly, China's IDAR strategy very closely resembles the same model that Samuels uses to describe the Japanese technonationalist guidelines of indigenization-diffusion-nurturing.[42]

Self-reliance has long been a fundamental goal of indigenous armaments production in *India*. Such an objective had military, political, and economic salience. As Ajay Singh put it:

> After independence, and the adoption of a policy of non-alignment, it was ... obvious that foreign policy would need to be reinforced by a policy of self-reliance in defense ... Prime Minister Jawaharlal Nehru believed that no country was truly independent, unless it was independent in matters of armaments.[43]

Quite early on, a distinction was made between 'self-sufficiency' and 'self-reliance'. Singh has defined the former as requiring that 'all stages in defense production (starting from design to manufacture, including raw materials) ... be carried out within the country'. He added that, 'To be self-sufficient, a country must not only have the material resources required for defense production, but also the technical expertise to undertake design and development without external assistance.' Self-*reliance*, on the other hand, was much more modest, as while it entailed the indigenous production of armaments, it allowed for the importation of foreign designs, technologies, systems, and manufacturing know-how.[44]

While self-sufficiency was the preferred approach, self-reliance has long been the practice when it comes to Indian armaments production. As such, New Delhi has long conceded the need to import considerable amounts of foreign military technology—mostly from the Soviet Union/Russia but also from France and the UK—in order to establish and expand its indigenous military-industrial complex. Thus, from the early 1960s to the late 1980s, India undertook the licensed production of several foreign weapons systems, including MiG-21 and MiG-27 fighter jets, Jaguar strike aircraft, Alouette III helicopters, T-55 and T-72 tanks, Milan antitank weapons, and *Tarantul* corvettes.[45]

At the same time, however, it was always New Delhi's intention to gradually and incrementally replace licensed production with indigenously developed and designed weaponry. Consequently, starting as far back as the 1950s, the manufacture of foreign-sourced military systems was complemented with local products.[46] India began development of its first indigenous fighter jet, the HF-24 *Marut*, in 1956, with first flight occurring in 1961. Truly indigenous armaments development and production, however, did not really take off until the 1980s, with the inauguration of several ambitious home-grown projects, such as the Light Combat Aircraft (renamed the *Tejas* in 2005), the Advanced Light Helicopter, the *Arjun* tank, and, especially, the Integrated Guided Missile Development Program, which involved the development of a number of tactical missile systems. While many of these 'indigenous' programs still incorporated considerable amounts of foreign technology or subsystems, the objective has always been to reduce this dependency along the lines of the evolutionary 'ladder-of-production' model, and eventually achieve true 'self-sufficiency'.[47] This intent was underscored, for example, in 1995 when New Delhi announced that within ten years it would increase its 'local content' of weapons systems in the Indian armed forces from 30 to 70 per cent.[48]

Techno-nationalism is also evident in the *ROK*'s historical approach to indigenous armaments production. The ROK is committed to a strategy of 'cooperative self-reliant defense',[49] includes the goal of 'acquiring the ability to independently develop primary weapon systems for core force capability'.[50] Moreover, the South Korean

government sees an advanced domestic defense industry as an important symbol of the country's 'coming of age', both as a high-technology powerhouse and as a regional power. Consequently, Seoul places a strong emphasis on a 'domestic weapons first' policy, a course of action that goes back to the early 1970s and the implementation of the Yulgok Project, an ambitious program of defense industrialization that was intended to lay down 'a basic foundation for a self-defense capability for the 21st century'.[51]

South Korea arms manufacturing began in the early 1970s, with the assembly of M-16 assault rifles under license from the USA. Local armaments production expanded greatly after the promulgation of the Nixon Doctrine, which reduced American defense commitments to Asia but at the same time liberalized the export of advanced military technologies to Asian allies. Consequently, Seoul invested billions of dollars into the domestic development and production of fixed wing and rotary aircraft, missile systems, tanks and armoured vehicles, artillery systems, large surface warships, and submarines. As a result, whereas in 1985 only 59 per cent of South Korea's arms were procured domestically, by 1995 this amount has risen to nearly 80 per cent.[52]

The ROK has particularly promoted its aerospace sector as a key strategic industry. It has poured billions of dollars into indigenous combat aircraft programs, starting with the licensed production of F-5 and later F-16 fighters, and the MD-500 light helicopter. In the late 1980s, Korea began developing a light turboprop trainer plane, the KT-1, followed by the T-50 supersonic jet trainer/light attack aircraft. More recently, the ROK has begun work on an advanced fighter jet, the so-called KF-X program, which is intended to enter service sometime during the 2020s. These projects, along with other military and commercial programs (including a planned 90-seat passenger plane), are part of a long-term strategy to propel the South Korean aircraft industry into the world's top 15 global aerospace producers by 2020.

Seoul also expects to greatly expand its defense exports, an area where it has traditionally been a minor player. South Korea has, for example, sold tanks and artillery systems to Turkey and infantry fighting vehicles to Malaysia. It has also enjoyed some success marketing its military aircraft; it has sold KT-1 trainer planes to Indonesia, Turkey, and Peru, and T-50 jets to Indonesia, Iraq, and the Philippines.

Indonesia undertook armaments production in earnest in the mid-1970s, with the establishment of several state-owned 'strategic enterprises', the most important of which were PT *Industri Pewsawat Terban Nusantara* or IPTN (aircraft), PT PAL (shipbuilding) and PT Pindad (small arms and munitions).[53] Under Suharto, Jakarta viewed armaments production both as a way to overcome the country's backward state of industrial and technological development, and as a means to leapfrog the country into the forefront of regional great powers. Suharto was particularly influenced by his minister for research and technology, B.J. Habibie (who later succeeded Suharto as president of the republic). Habibie, an aerospace engineer by training, explicitly viewed the establishment of an aerospace industry as both an instrument and a model for advancing the country's overall technology and industrial base.[54] For him, IPTN in particular was to serve as an indicator of Indonesia's intentions to become a modern industrialized nation and 'to prove that a Third World,

Muslim-majority country could make a hi-tech leap into global aviation'.[55] Just as important, a powerful defense industry was intended to make Indonesia into a military power to be reckoned with in Southeast Asia. IPTN began by license-assembling helicopters and light transport planes, and later manufacturing components for F-16 fighters and British Hawk trainers being acquired by the Indonesia air force. In the early 1980s, it entered into a joint venture with Construcciones Aeronáuticas SA of Spain to codevelop and manufacture the CN-235 military/commercial transport aircraft (which was subsequently also exported to the United Arab Emirates, Brunei, Malaysia, Pakistan, South Korea, and Thailand). In addition, PT PAL built patrol boats for the Indonesian navy, while PT Pindad manufactured assault rifles and pistols, and developed the *Panser*, an indigenous 6×6 wheeled armoured personnel.

Techno-nationalism and the State

Not surprisingly, techno-nationalism greatly stresses the role of the state and downplays market forces when it comes to cultivating local arms industries. Governments are usually intimately and actively involved in the technonationalist process of defense industrialization.[56] In Asia, consequently, the state has typically played an instrumental role in the establishment and nurturing of indigenous arms industries. In many instances, armaments production has been either wholly or partly dominated by the state, through military-run or state-owned and -operated enterprises, such as are found in China, India, and Indonesia. However, even when weapons manufacturing is embedded in private industry—such as in Japan or South Korea—the government generally underwrites armaments production via direct investments, tax incentives, monopoly sourcing, guaranteed military contracts, and the like.[57] In the case of Japan, for example, the government encouraged local industries to participate in arms manufacturing by selecting sole-source suppliers, ensuring production contracts, guaranteeing (low but steady-state) profits, providing *de facto* R&D subsidies, and permitting opportunities for spin-off into more lucrative commercial endeavours (such as commercial aerospace).[58] In South Korea, the government encouraged firms to enter into arms production through a variety of incentives—such as tax breaks, low-interest loans, and direct subsidies—and coercive measures (such as tying defense contracting to state support for engaging in other types of commercial production).[59] In addition, the Korean government, through the state-owned Korea Finance Corporation, controls a 26.4 per cent stake in Korea Aerospace Industries (KAI), the country's leading military aircraft manufacturer.

In addition, the state has typically assumed most, if not all, of the risk and costs for weapons development and production, by intervening on the supply side to mandate and fund indigenous solutions for a military hardware requirement. In Asia, for example, in most cases state-run defense R&D institutes undertake the actual design and development of military systems that are subsequently provided to arms factories for production. This strategy is particularly pronounced in the case of Asian aerospace industries, where the bulk of production has traditionally been directed toward meeting domestic defense demands.

Techno-nationalism and the Role of Foreign Technology

When countries—and especially emerging arms producers—decide to enter into indigenous arms manufacturing, they have tended to follow roughly similar patterns of industrialization and production. This process usually entails a series of gradual and progressive steps leading to greater sophistication and self-sufficiency in the design, development, and manufacturing of weapon systems. As such, it has often been described as the 'ladder of production', and while scholars may disagree as to how many steps there are in this process or the precise ordering of these stages of production, the idea that countries engage in an evolutionary and incremental mode of defense industrialization is broadly accepted.[60]

According to the ladder of production, indigenous arms production is a process of transitioning from extremely high to very low levels of foreign dependency for weapons and production technologies. Initial armaments production tends to rely heavily on imported technical assistance from countries possessing already well-advanced defense industries. Most second-tier arms-producing countries start out by assembling weapon systems from imported parts and components (knock-down kits). The next step usually consists of the licensed production of foreign weapon systems, with some (and, in many cases, eventually nearly all) of the actual manufacturing of components and subsystems performed indigenously. This is usually followed by limited indigenous development and production of relatively simple, 'low-tech' armaments—such as small arms, ordnance, or small patrol boats—along with the codevelopment of more sophisticated armaments in partnership with more advanced foreign arms producers. Particularly at these later stages in the ladder-of-production model, basic arms-manufacturing capabilities are increasingly supplemented by incremental improvements in the country's independent military R&D base. Accordingly, a country may attempt to indigenously produce more complex (i.e. 'mid-tech') weapon systems, such as light armoured vehicles or trainer aircraft. Lastly, a country may attempt to design and develop its own advanced weapon systems—such as fighter aircraft, missiles, submarines, large surface combatants, or military electronics—either across-the-board or by carving out certain niches or specialties.

There is no disingenuousness in the relationship between the technonationalist model and the use of foreign technology in order to advance the cause of autarky. Indeed, most techno-nationalists freely concede the necessity of importing technology—considerable amounts of it, in fact, especially at the beginning—and, historically, most cases of technonationalist-based defense industrialization have depended quite heavily on foreign technology and know-how. As Samuels put it:

> Self-reliance in technology does not mean autarky ... [it] refers to the ability to absorb all needed technologies, and the attainment of this self-reliance is attained not at a stroke but in stages.[61]

Techno-nationalism and techno-globalism are not necessarily incompatible with each other, therefore; indeed, they complement each other.[62] *All* aspiring arms-producing nations in Asia have use foreign technologies to some extent, in order to learn,

leapfrog, reduce costs, shorten R&D timeframes, and avoid technological blind alleys. Post-war Japan and South Korea, for example, relied heavily upon the USA for defense technology and production know-how in their initial arms-production phases, particularly when it came to the licensed production of American military systems. India depended on considerable aid and assistance from Britain, France, and the Soviet Union when it began the process of indigenous defense industrialization.

The PRC's initial arms-manufacturing base was essentially a copy of the Soviet model, entailing not only the license-production of Soviet weaponry but doing so in turnkey factories provided wholesale by the Soviet Union. Even as late as the 1980s and 1990s, Beijing frequently resorted to foreign suppliers for technologies that it could exploit for national military-industrial development. During the 1980s, for example, China imported helicopters from France, missiles from Italy, and radar systems from the UK; many of these systems were subsequently reverse-engineered and produced in Chinese factories. The USA had a joint development program ('Peace Pearl') with China to upgrade the latter's F-8 fighter jet, and Washington also provided China with torpedoes and artillery-locating radar that were likely exploited later on for technological gain.[63] After the 1989 arms embargo (imposed on China by the USA and the European Union in response to the Tiananmen Square massacre), China turned then to Russia, and during the 1990s and early 2000s it imported considerable amounts of defense technology from Russia. Beijing acquired a license to locally produce the Su-27 fighter jet, which it later copied and now illegally manufactures as the J-11B. China has also exploited Russian defense technologies in such areas as air-to-air, air-to-ground, and surface-to-air missiles, precision-guided munitions, submarines, and even manned space systems.[64]

At the same time, the ultimate goal was always autarky in innovation. Foreign dependencies were generally perceived to be tactical and short-term, a 'necessary evil' in order to underwrite indigenization and development (Samuels, e.g. asserts that the Japanese saw license-production has a 'middle road' toward autarky[65]). Techno-nationalism, therefore, does not mean totally autarky, at least, not initially: it permits the acquisition of foreign technologies should they provide positive benefits (i.e. short-cuts to technological advancement). As Samuels put it in the case of Japan:

> International collaboration and indigenization do not work at cross-purposes in Japanese practice ... Indeed, a key lesson of the Japanese case is that national systems of innovation can be integrated in the global economy without sacrificing their integrity. Japanese scientific and technological networks have long been linked internationally in ways that actually reinforce nationalism. International networks neither obviate the relevance of national systems [of innovation] nor dilute technonational incentives ... [G]lobalization will not obviate national systems of innovation.[66]

In short, techno-globalism is acceptable and permissible if it leads to the eventual objective of self-sufficiency.

Conclusion: Techno-nationalism and Its Challenges

The author, in an earlier article, stated that:

> the Asian defense industry overall is perhaps unique in its persistence in following a decidedly technonationalist approach demanding self-sufficiency in armaments production. Among the nations in the region who do produce arms, there is an almost obsessive predilection for self-reliance when it comes developing and manufacturing arms, and consequently these countries have invested considerable resources into their defense technological and industrial bases. The dilemma facing these countries is whether such a go-it-alone strategy is still feasible—that is, can it build and sustain technologically advanced domestic defense industries? In other words, even if these countries are willing to pay the 'techno-nationalist' premium for continued autarky, will it be sufficient for the task of developing and manufacturing next-generation weapons systems?[67]

As a strategy for Asian defense industrialization, techno-nationalism has been an arguable success. Before World War II, most Asian nations possessed few or no means for indigenous arms manufacturing, and the one country that did—Japan—saw that capacity either destroyed in the war or largely dismantled afterwards. Starting basically from scratch in the 1950s and 1960s, China, India, Japan, and South Korea were able construct (or reconstitute) substantial defense industries, able to produce a broad range of defense materiel. Even Indonesia was able to achieve a modicum of self-reliance in arms acquisition in certain sectors, such as aerospace, as were other countries in the region, including Singapore and Taiwan. On the surface, therefore, a state-led national defense innovation and manufacturing strategy, driven to a large extent by the argument that autarky is a crucial element of national security, appeared to pay considerable dividends.

But is it accurate to say that techno-nationalism is an effective and efficient approach to armaments production? As an industrial strategy, it can be a very expensive endeavour. Japan, for example, makes some of the most costly weapons in the world, due in large part to small, extended production runs. Its indigenous F-2 fighter jet, for example, has a price tag of least USD 120 million apiece, or approximately three times that of the F-16 upon which it is based. Escalating expenses caused the Japanese to cut total F-2 production from 141 to only 94 planes—which only increased its unit cost more.[68] Japan's Type-10 main battle tank costs over USD 11 million apiece (compared to around USD 8.5 million for a comparable American-built M-1A2 Abrams tank), and is produced at a rate of just a dozen or so per year. As Hughes put it: 'Japan's defense planners have sought the "holy grail" of pure indigenous defense production and consequent technological autonomy … even if these present development risks and high procurement costs.'[69] Even licensed production of foreign weapons systems is not as cost-efficient as simply buying off-the-shelf; according to a Belgian study cited in *The Economist*, defense offsets raised the price of arms procurement by around 20–30 per cent.[70]

Even then, indigenous defense industries and local arms programs are highly prone to failure. The story of India's defense industry is a nearly unbroken story

of disappointments and setbacks. The country's indigenous *Tejas* fighter jet, initiated in the mid-1980s, did not have its first flight until 2001, more than a decade behind schedule, and it only achieved initial operating clearance in late 2013. India's *Arjun* main battle tank did not enter service with the Indian Army until 2011, more than 30 years after the program was initiated. The program has had a history of technical problems, resulting in horrendous delays and cost overruns: the tank is reportedly more than 16 years behind schedule and 20 times over its original cost estimates.[71] For its part, Indonesia's aerospace industry never found any traction, failing to find even one viable long-term aircraft-manufacturing program. In the late 1990s, after pouring billions of dollars into IPTN programs—including an unsuccessful effort to build a 50-seat turboprop commercial airliner—Jakarta finally pulled the plug on the company; IPTN was restructured and at least three-quarters of the workforce was laid off.[72] In the cases of Japan and Korea, local arms industries still require considerable financial support from their governments in the form of preferential supply contracts or excess production runs; In 2000, for example, the Korean government decided to buy additional F-16 fighters—over the objections of its air force, which claimed that they were unnecessary—in order to keep KAI, one of the country's key aerospace firms, open until the T-50 went into production.[73]

More critically, it is uncertain whether these domestic arms programs are that much of an improvement over the foreign weapons they are intended to supplant. In fact, most of the time, better and cheaper military equipment can be found on the global arms market. Hughes argues that Japan's indigenous F-1 fighter, built during the late 1970s/early 1980s, was 'obsolete almost as soon as it went into production'.[74] The military has been forced to continually scrounge for foreign stopgaps to compensate for underperforming local systems, buying Su-30MKI combat aircraft and T-90 tanks from Russia, and Rafale fighter jets from France. Even licensed production of a foreign weapons system has hardly been cost-effective: for example, Seoul's insistence on locally manufacturing the American F-16 fighter added about 20 per cent to the total cost of the program; efforts to license-produce the F-5 fighter and MD-500 helicopter added similar cost surpluses, and also transferred little by way of advanced technology.[75] As Green put it, 'expensive domestic development programs', came at a 'heavy price to pay in terms of military efficiency'.[76] Although he was referring only to Japan, this assertion could be applied to most arms-manufacturing activities in Asia.

Finally, the technonationalist model hardly appears to be a shortcut to advanced armaments production. In large part, this is because local defense R&D bases still possess only limited capacities for independent innovation. Heavy initial dependencies on foreign technology inputs still require countries to make sufficient investments in their indigenous military R&D bases in order to truly indigenize imported technology or to innovate. And yet, most Asian nations, bar China, have consistently underfunded national defense R&D. Consequently, most indigenous defense projects are starved of funding, making it very difficult for local defense industries to move up the 'ladder of production' and to achieve greater autarky, especially when it comes to highly advanced weapons systems.

Too often, in fact, Asian governments have chosen weapons programs more for their 'doability' (i.e. the likelihood that they will succeed), and for their potential to support and advance local arms industries, rather than for their actual military need. Military requirements too often become procrustean things, therefore, stretched to fit to what local industries can deliver, rather than driving acquisition, R&D, and production. As Richard Samuels has put it so bluntly, 'in Japan, by far the most important thing about a weapon is learning how to make it'.[77]

As a result, the technonationalist strategy results in a considerable amount of effort and resources being wasted on 'reinventing the wheel', that is, replicating weapons systems (combat aircraft, armoured vehicles, assault rifles, even missile systems) that are widely and more cheaply available on the global arms market. At the same time, techno-nationalism comes with some very high opportunity costs: countries pay a premium for autarky in armaments acquisition, while also risking losing access to global dynamics of technology diffusion and innovation. Ultimately, techno-nationalism may be just was Reich was arguing in the beginning: that it is more an emotional appeal based on 'irrational nationalism', than it is a sound strategy for armaments production.[78]

Of course, it is arguable that the pursuit of autarky has nothing to do with why many states engage in indigenous armaments production. Rather, these countries operate under a 'half a loaf' theory: that it is better to have some defense industries than it is to have none. This approach supplies them with at least a modicum of self-reliant military power, and, what is more, it endows them with indigenous capacities in order to tailor weapons systems to unique national requirements. Israel appears to have learned this lesson, for example, and Japan may be (begrudgingly) learning it as well.[79] That said, even a modest approach to arms production could still face many technological hurdles, as well as being difficult to sustain economically. At the same time, it may not make much of a contribution to overall national defense.

Nevertheless, the siren song of military techno-nationalism is still very powerful. What is the most interesting about Asian arms industries is how enduring they have been *despite* the fact that they seem to produce few economic benefits or, more critically, to contribute so little (relative to their costs) to guaranteeing security of supply or expanding a country's military-technological capacities for national defense. Asian armaments production has rarely been cost-effective or militarily significant in terms of turning out state-of-the-art military equipment. And yet, most large powers in Asia have not abandoned the idea of autarky in armaments production. On the contrary, China and India still have *explicit* technonationalist industrial strategies when it comes to arms acquisitions, and the pattern of defense industrialization in South Korea over the past 25 years shows that autarky still wields strong influence there as well. Even Japan is not giving up on certain dreams of self-sufficiency, as evidenced by its recent decision to greenlight the ADT-X stealth fighter program.[80] If Asian arms producers are persisting in their efforts despite the costs or dubious military benefits, then it is probably more due to the technonationalistic appeal of autarky than any to economic or national-security gains. In the end, it is hard to see autarky without techno-nationalism, or techno-nationalism without autarky.

Disclosure Statement

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NOTES

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